WHAT IS CLAIMED IS:

1. A computer-implemented method of mirroring a component of a three-dimensional object modeled in a computer-simulated three-dimensional modeling space, the method comprising:
receiving data to select a first component of the three-dimensional object;
automatically analyzing a plurality of candidate orientations to select a preferred orientation for creation of a reproduction of the first component; and
creating a new component of the three-dimensional object that is a reproduction in the preferred orientation of the first component, the new component being created based on a position of the first component with respect to a surface positioned in the three-dimensional modeling space.

2. A computer-readable data storage apparatus comprising instructions for configuring a computer system to perform the method of claim 1.

3. The method of claim 1 further comprising receiving input from a user to position the surface in the three-dimensional modeling space.

4. The method of claim 1 wherein:
the surface comprises a plane logically separating the modeling space into a first and a second section; and
the first component is positioned in the first section of the modeling space; and
creating the new component comprises creating the new component in the second section.

5. The method of claim 4 wherein:

the first component comprises a first plurality of vertices; and

creating the new component comprises determining a second plurality of vertices, each vertex in the second plurality corresponding to a vertex in the first plurality, and each vertex in the second plurality being determined based on a position of said corresponding vertex with respect to the plane.

6. The method of claim 4 wherein creating comprises creating such that the first and the new component are in symmetrical positions with respect to the plane.

7. The method of claim 1 further comprising:

applying a plurality of transformations to the first component to determine the plurality of candidate orientations; and

selecting one of a plurality of procedures for constructing the new component, the plurality of procedures comprising a truly mirrored copy procedure and a copy procedure, the copy procedure comprising one of the plurality of transformations.

8. The method of claim 1 wherein:

the first component comprises a plurality of first sub-components; and

creating the new component comprises creating a plurality of new sub-components, each of the new sub-components corresponding to one of the first sub-components.

9. The method of claim 8 further comprising:

applying a plurality of transformations to each of the first sub-components to determine the plurality of candidate orientations of each corresponding new sub-component; and

analyzing each of the candidate orientations of each of the new sub-components to determine existence of a candidate orientations meeting predetermined selection criteria indicative of a preferred transformation.

10. The method of claim 8 further comprising:

based on said predetermined selection criteria, determining ones of the new sub-components that are to be created as truly mirrored sub-components and ones of the new sub-components to be created as replicated components,

11. The method of claim 10 further comprising generating a bill of materials wherein:

for each of the first sub-components that is reproduced as a truly mirrored sub-component, said first sub-components and said truly mirrored sub-components are represented in the bill of materials as different line items; and

for each of the first sub-components that is reproduced as a replicated sub-component, said each first sub-components and said replicated sub-components are represented in the bill of materials as instances of the same line item.

12. A computer-implemented method for generating components of an object modeled in a three-dimensional modeling space provided by a computer aided design system, the method comprising:

positioning a plane in the three-dimensional modeling space to logically subdivide the modeling space into a first division comprising a first component and a second division in which a reproduction of the first component is to be located and to define a reference geometry for creation of the reproduction of the first component;

computing a plurality of geometrically transformed components by applying a plurality of different transformations to the first component, each transformed component comprising a different orientation of the first component; and

constructing the reproduction of the first component such that the first component and the reproduction are symmetrical to each other with respect to the plane.

13. A computer-readable data storage apparatus comprising instructions for configuring a computer system to perform the method of claim 12.

14. The method of claim 12 wherein constructing the reproduction comprises:

determining a preferred geometric transformation of the first component for use in constructing the reproduction by comparing locations of geometric features of the transformed components.

15. The method of claim 14 wherein:

the first component comprises a plurality of sub-components;

computing the plurality of geometrically transformed components comprises, for each one of the plurality of sub-components, applying a plurality of transformations to said one of the plurality of sub-components; and

determining a preferred geometric transformation comprises determining for each one of the plurality of sub-components a manner in which to construct a corresponding reproduction.

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17. The method of claim 15 wherein the manner in which to construct the corresponding reproduction is selected from the group consisting of generating a truly mirrored component and generating a replicated component.

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18. The method of claim 17 further comprising generating a bill of materials comprising a plurality of line items, the bill of materials being generated such that:

a first one of the first plurality of sub-components and a corresponding truly mirrored component are represented as different line items; and

a second one of the first plurality of sub-components and a corresponding replicated component are represented by different instances of the same line item.

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19. The method of claim 14 wherein:

the first component comprises a first plurality of vertices;

comparing locations of geometric features comprises comparing locations of vertices;

comparing locations of vertices comprises:

computing a plurality of mirrored vertices, each mirrored vertex corresponding to one of the first plurality of vertices, such that each mirrored vertex and said corresponding one of the plurality of vertices are equidistant to the plane and positioned on different sides of the plane; and

for each one of the transformed components, computing an acceptance value based on a difference between locations of vertices of the transformed component and locations of the plurality of mirrored vertices, the acceptance value indicative of a preferred transformation.

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20. The method of claim 19 wherein the acceptance value is a standard deviation value and the method further comprises determining a preferred geometric transformation by comparing the standard deviation value for each of the transformed components to a predetermined criteria indicative of a preferred transformation.

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21. The method of claim 12 wherein:

each one of the plurality of different transformations comprises a transformation positioning a principal axes and a centroid of the first component at a position on the second side of the plane and is symmetric to the position of a principal axes and centroid of the first component.

~~22~~ 21. The method of claim 12 further comprising:

storing a data structure associating the first component and the reproduction; and

initiating an update of the reproduction in response to a change in the structure of the first component.

~~23~~ 22. The method of claim 15 further comprising:

logically integrating the reproduction into the model such that the model comprises both the first component and the reproduction; and

storing a data structure to establish a mating relationship between the corresponding reproduction of a first one of the plurality of sub-components and the corresponding reproduction of a second one of the plurality of sub-components, said data structure comprising data to initiate a corresponding positional transformation of the corresponding reproduction of the first one of the plurality of sub-components in response to a positional transformation of the corresponding reproduction of the second one of the plurality of sub-components.

~~24~~ 23. The method of claim 23 wherein:

the mating relationship comprises a type selected from a group consisting of parallel, angle, coincident, concentric, distance, perpendicular, and tangent.

~~25~~ 24. The method of claim 23 further comprising:

automatically creating the mating relationship to mate a geometric feature of the corresponding reproduction of the first one of the plurality of sub-components with a corresponding geometric feature of the corresponding reproduction of the second one of the plurality of sub-components.

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26. A computer-aided design system for processing data representing construction of a three-dimensional object, the system comprising:

a processing unit coupled to a program storage medium, the program storage medium comprising instructions to configure the processor to:

calculate a plurality of orientations for a first component with respect to a plane, each one of the plurality of orientations comprised of a plurality of vertices;

calculate a plurality of reflected vertices for the first component;

compute a plurality of deviation values, one deviation value computed for the plurality of vertices of each one of the plurality of orientations and the plurality of reflected vertices; and

construct a first reproduction of the first component in a manner determined by the plurality of deviation values.

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27. The system of claim 26, wherein the program storage medium further comprises instructions to configure the processor to:

compute one of the plurality of deviation amounts equal to a result considered zero; and

construct the first reproduction by replicating the first component.

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28. The system of claim 26 wherein the program storage medium further comprises instructions to configure the processor to:

compute the plurality of deviation amounts equal to a result considered non-zero; and

construct the first reproduction by reflecting the first component.

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29. The system of claim 26 wherein the instructions to configure the processor to calculate the plurality of orientations for the first component comprises instructions to:

construct a plurality of transformations; and

apply each one of the plurality of transformations to a plurality of geometric features of the first component.

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30. The system of claim 26 wherein the program storage medium further comprises instructions to configure the processor to:

build a hierarchical data structure comprising a hierarchical relationship between the first component and a second component;

construct a second reproduction, the second reproduction symmetrically positioned with respect to the second component and the plane;

include the first reproduction and the second reproduction in the hierarchical data structure; and

establish the hierarchical relationship between the first reproduction and the second reproduction.

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31. The system of claim 26 wherein the program storage medium further comprises instructions to configure the processor to:

create a mating relationship between the first reproduction and a second reproduction corresponding to a second component.

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32. The system of claim 31 wherein the program storage medium further comprises instructions to configure the processor to:

determine a first geometric entity belonging to the first reproduction, the first geometric entity similarly positioned to a reflected first mated geometric entity belonging to the first component;

determine a second geometric entity belonging to the second reproduction, the second geometric entity similarly positioned to a reflected second mated geometric entity belonging to the second component; and

define the mating relationship using the first geometric entity and the second geometric entity.